
NEW PROGRAM PROPOSAL FORM

Sponsoring Institution(s): Harris-Stowe State University
Program Title: Sustainability and Urban Ecology
Degree/Certificate: B.S. / Certificate in Urban Agriculture
Options: Choice of one of three areas of concentration for a B.S. in Sustainability and Urban Ecology

1. Concentration in Science (Biology-Chemistry)
2. Concentration in Urban Agriculture
3. Concentration in Computation and Physical Science

We will also offer a one-semester certificate program in Urban Agriculture for anyone who is interested.

Delivery Site(s): Harris-Stowe State University

CIP Classification: 30.3301

*CIP code can be cross-referenced with programs offered in your region on MDHE's program inventory higherred.mo.gov/ProgramInventory/search.jsp

Implementation Date: Fall 2015

Cooperative Partners: None

*If this is a collaborative program, form CL must be included with this proposal

AUTHORIZATION:

Dr. Dwyane Smith, Vice President for Academic Affairs

Name/Title of Institutional Officer	Signature	Date
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MISSION STATEMENT:

The Sustainability and Urban Ecology degree program will prepare students for careers directed to developing sustainable urban environments in a world increasingly concerned with issues of sustainability and resource usage. Environmental management, landscape protection, recreation, parks and public land planning, population growth, urban health and pollution issues, transportation and mass transit, energy requirements and urban sprawl are issues in focus.

Through this program students will understand the science of sustainability, healthy urban landscapes, and the complexity of issues that relate quality of life and environmental health. They will get acquainted with current technological tools and acquire laboratory and computational skills for analyzing and modeling urban environs.

The BS degree in Sustainability and Urban ecology will have three concentration areas, one in science (Biology and Chemistry) whose focus will be in urban ecosystems, urban health, nutrition, environmental pollution and environmental science, one in Computational and Physical Science that will focus on modeling of urban landscapes, energy science (climate modeling, energy, the built environment, and transportation

systems), numerical methods, and statistics, and one in urban agriculture whose focus will be on sustainable food production in the urban environment, through modern methods of hydroponics, and harvesting, through the use of greenhouses, and restored and available urban land. Nutrition, botany, food preservation, and the diagnosis and treatment of plant diseases will be included in this concentration. A common core will include GIS, environmental policy, and environmental science. Since urban planning, urban sociology, and urban policies are important aspects of urban societal structuring there will be elective options in these areas.

A 14 credit hour certificate in Urban Agriculture will be available for those who want to join the workforce or pursue a passion in the growing area of urban farming and community gardening.

2. RATIONALE:

Urban Ecology is the study of urban ecosystems with humans being the dominant species. Traditionally in ecology the human has existed on the outside of the ecosystem and was seen as looking in. The world is becoming increasingly urbanized and with human population growth (it is predicted that in the next 30 years 2 billion more people will be living in urban areas) there is an increasing need to study urban ecosystems with humans as the dominant species in that system. The study of sustainability along with urban ecology seeks to provide for human needs in a more sustainable manner. This is a growing field of interest in a world that is increasingly concerned about resource usage, climate change, and economic and environmental stability across the globe.

A field such as Sustainability and Urban Ecology is particularly suited for enhancing STEM learning in a school such as Harris-Stowe State University (HSSU). Urban Ecology is rooted in diverse disciplines such as biology (ecology, urban biodiversity, restoration and reconciliation ecology), mathematics (statistics, modeling), physical science (physics: energy science, thermodynamics, material science, chemistry: pollution, air quality), engineering, urban planning, geography, and others. Because of these diverse roots a program in Sustainability and Urban Ecology is highly interdisciplinary requiring a strong interface between biology and mathematics, as well as geography (GIS) and urban studies. HSSU is perfectly suited, by location and design to offer this degree program. Many of the courses needed to support this degree program are already in the curriculum. The Biology degree program has a minor offered in the field. Additionally HSSU students are mostly drawn from the urban Saint-Louis area and have an interest in urban issues.

The degree program will help students develop skills that are suited for careers in the urban environment. Also, with more graduate schools creating interdisciplinary programs in urban ecology and sustainability [1-5] students with a BS in a Sustainability and Urban Ecology that is interdisciplinary in nature [6] will be uniquely qualified for such graduate programs.

The computational and Science concentrations in this program will help further STEM area competencies. HSSU has a Biology degree program with a minor in urban ecology for which many of the Biology and Physics courses for the sustainability and urban ecology degree have already been established (for example Urban Ecosystems, and Energy Science). Additionally courses in statistics have been created as part of the recently established Math degree program (these courses are of great importance in a field such as Sustainability and Urban Ecology). It is a perfect opportunity to expand into a full-fledged Urban Ecology degree program and explore its cross and interdisciplinary nature.

Sustainability and Urban Ecology studies require the learning of modern technologies and an exposure to computer programming and analysis. Tools like GIS, and spatial and geo statistics, and computer modeling are necessary to make sense of and help sift [7] through all the data (data for example on green cover, temperature, climate, and physical and mental health, from different cities at this point in time or a given city in time) available today through remote sensing equipment. The skills and training they get through this program will serve them well even if they decide to explore post baccalaureate industrial or academic careers outside their major.

A major aspect of urban requirements is food. There is a growing interest in making urban areas more self-sufficient in terms of food production. Community gardens, growing on restored lands and vacant lots, and vertical gardening are amongst the venues to make this self-sufficiency actualize. There are also movements to bring chickens, farm animals, and even apiaries into urban areas (<http://www.nytimes.com/2008/05/07/dining/07urban.html>). Missouri is well suited to be a major food producer and Saint Louis (river and land) is increasingly becoming involved in urban farming and agriculture. (<http://news.stlpublicradio.org/post/tour-urban-farms-st-louis>). It is timely to have a degree in sustainability and urban ecology to incorporate a concentration in urban agriculture. Additionally a certificate in Urban agriculture (14 credit hours) will also be offered.

The new degree program will allow STEM faculty at Harris-Stowe with roots as a teaching institution to become involved in interdisciplinary research projects in a new and upcoming field, using STEM techniques they are already familiar with.

STUDENT ENROLLMENT PROJECTIONS

Year	1	2	3	4	5
Full Time	2	10	20	30	40
Part Time	3	3	6	6	6
Total	5	10	26	36	46
FTE	3	11	22	32	42

Please provide a rationale regarding how student enrollment projections were calculated:

There are students in Harris-Stowe's Biology program who are interested in urban ecology even among Biology degree students without a minor. While an overwhelming number of Biology students enroll planning to earn a minor in Pre-Med, it is becoming increasingly obvious this career choice is often due to familiarity than with real interest in medicine and medical-related fields. There have been discussions and workshops on diverse careers in STEM and many pre-medicine minors are realizing that a medical career is not their main interest. It is expected that these students and some other biology majors (4%-7% students) will be recruited into the Sustainability and Urban Ecology degree program. This will not significantly impact the Biology enrollment numbers, as there are a large number of Biology students but will give students in Biology an alternative option from pre-medicine. A growing interest in sustainability will assist in the institution's recruitment efforts. It is expected that the institution's recruitment efforts will earn high yields by the 3rd year of the inception of the program. The added incentive for students will be that they will acquire computational and statistical skills through the program. This too will help recruit students in the program. Students with an interest in ecology who are interested in computation will have the option of pursuing an urban ecology degree with a computational concentration. The growing interest in urban gardens and local farming will

attract hobbyists, enthusiasts and members of the workforce to get a urban-agriculture certification, or even get a degree with a concentration in urban-agriculture concentration. A sustainability grant from UNCF in 2010 allowed HSSU to have a summer sustainability effort that was very successful. This shows a general favorable climate on campus for programs like Sustainability and Urban Ecology. The expectation is that the institution will have a yearly average of at least 10 students graduating from the 7th year after inception.

Provide a rationale for proposing this program, including evidence of market demand and societal need supported by research.

4. Market Demand/Societal need

A degree in Sustainability and Urban Ecology is timely given the push for green living and green-technologies from government agencies. In the past, environmental science largely focused on the green spaces beyond the urban boundaries without worrying too much about urban growth dynamics and the ecology of the city that derived its resources from the spaces beyond. However the urban population is growing rapidly, and with increasing worries about issues such as global warming, and excessive energy demand, attention has moved to urban areas to reduce their contribution to the same. In order to keep cities sustainable yet healthy, one must look into planning energy efficient cities, health and social issues in the urban areas, issues of mass transit, and renewable energy usage, as factors that affect the ecology of the city, along with urban agriculture, restoration ecology as a way to increase and maintain biodiversity in urban areas. The field of urban ecology is approached from a science and social science perspective and requires statistical, and numerical analysis. Harris-Stowe's program will offer concentrations in science (Biology-Chemistry), and computation and physical science. Employment in statistics, agriculture and nutrition, wildlife management, urban health care, urban housing, ecological economics, and environmental law, are amongst options for graduates. Additionally with sustainability and urban ecology graduate programs increasingly available [1-6] students have the option of pursuing graduate studies in these fields as well as those in environmental science, restoration ecology, horticulture, and urban studies after obtaining a BS degree.

New green focused jobs are increasingly being created. The City College of New York proposed an interdisciplinary master's degree program on sustainability motivated by the interest in sustainable practices across industry, commerce, and government [5]. From their website:

"Entrepreneurs are creating new firms with a sustainability focus, to address issues in energy, water resources, air quality, land use, waste management, transportation, construction, and urban planning. PlaNYC 2030 has achieved critical momentum, and will generate demand for hundreds of project managers, analysts, managers, researchers, and consultants. New job titles are emerging, e.g., Sustainability Manager; Sustainability Plan Examiner; Sustainability Compliance Director; Sustainability Coordinator; Director of Energy Efficiency; Clean Air/Clean Energy Specialist; Renewable Energy Consultant; Green Building Coordinator; LEED Project Supervisor; and Life Cycle Modeling Specialist."

Lynell Engelmeyer who has over 20 years of experience in college admissions and financial aid [8] states:

"According to a survey conducted by the American Solar Energy Society, an estimated 37 million jobs are likely to be created in the renewable energy and energy efficiency industries

in the United States by 2030 (Brown, 2009). Opportunities will exist at virtually every turn. The career potential is so big that Marie Kerpan, founder of Green Careers consulting practice said, "There are a bazillion companies where you can take your skills and put it to work in a 'green company.'" Bronwyn Llewellyn recognized much potential in this sector that she authored "Green Jobs: A Guide to Eco-Friendly Employment."

There will always be a place for scientists and engineers in the sustainability arena, but there will be an increasing need for marketing and advertising experts, policy analysts, accountants, and sales people who understand this arena. An unpredictable economy means that students must determine how to differentiate themselves and how to fill job needs. Green careers hold great promise to be able to do this for many years to come."

According to the WashingtonTimes[9] a research report on the clean energy economy released by the Pew Charitable Trusts in Washington has found green jobs growing at 9.1% to an overall job growth of only 3.7% over a 10 year span from 1998-2007. Pew said this green job growth exceeded traditional job growth in 38 states with the clean energy economy accounting for 770,000 jobs and more than 68,000 businesses across the country.

"These jobs are driving economic growth and environmental sustainability at a time when America needs both," said Lori Grange, interim deputy director of the Pew Center on the States, in releasing the new data Wednesday. "There is a potential competitive advantage for federal and state policy leaders who act now to spur jobs, business and investments in the clean energy sector."

The Pew report sought to define the clean-energy economy, noting that it "generates jobs, businesses and investments while expanding clean-energy production, increasing energy efficiency, reducing greenhouse gas emissions, waste and pollution and conserving water and other natural resources."

Pew said venture capital investments in clean technology surpassed the \$1 billion mark in 2005, hitting \$12.6 billion by the end of 2008. Last year's investments were a 48 percent increase over 2007. States are set to receive \$85 billion from federal stimulus money in direct spending and tax incentives for energy and transportation-related programs."

According to Logan Yonavjak[10] one should also take into account job possibilities in restoration ecology and while more research is needed preliminary data is promising.

"Early findings show that the U.S. has a highly active restoration industry, contributing growth and jobs to the national economy in the short-term, as well as long-term value and cost savings. The preliminary figure for national direct economic spending for the restoration industry comes to \$10.6 billion annually [11]. Restoration investments appear to have particularly localized benefits, and tend to employ local labor and materials. And, although contractors and workers may experience seasonal and inter-annual fluctuations in income and employment, preliminary findings indicate that restoration jobs are well compensated in comparison to average wages. These findings are similar to counterparts in the construction industry."

Considering the potential growth of this field, and its huge market potential in the green sector in urban areas, a Bachelor of Science degree in Sustainability and Urban Ecology has the promise of becoming a highly useful degree. A science concentration can prepare one for careers such as Environmental Technologist/Technician, Conservation Biologist, Botanist, Horticulturist, Parks and Recreation Specialist or Corporate Recycling Manager, as well as in pollution management and the energy and waste management arena. A concentration in mathematics will provide students with career options in statistics, modeling, and programming analysis, transportation and mass transit planning, as well as in surveying and disaster

management. Some of these options could be available upon graduation while others might require further studies (graduate/law school) for which students will be prepared through the degree program. The interdisciplinary nature of the degree (options for electives, requirements of GIS for all concentration areas, requirement of 9 credit hours in concentration areas outside one's elected one) allows for career options in the urban sector that would require cross-disciplinary training. For example, transit management would require mathematical as well as urban studies experiences.

The Urban agriculture concentration and certificate programs are of significance as urban farming becomes increasingly popular. According to National Geographic (<http://environment.nationalgeographic.com/environment/photos/urban-farming>) "Rooftop and patio gardens create peaceful places for relaxation or contemplation, and they can attract tourists—consider the booming businesses that have sprung up around New York City's lush High Line Park. And urban farming can bring jobs to underserved and depressed urban areas."

As more plants are grown in the city for food there will be need for expertise in indoor and outdoor plant management and production, control of pests, and the prevention and treatment of plant diseases. The Urban Agriculture aspect of the degree program will provide such know-how and training.

Societal Need:

Sustainability and Urban-Ecology is the focus of societies dealing with increased global demand for non-renewable resources, and grappling with the resulting excess production of global-warming gases and their associated deleterious effects on health and the environment. The study of urban landscape ecology is a focus of 21st century science. While two percent of the world population lived in urban areas in 1800 this increased to 14% in 1900 and in 2007 was over 50% [Wu; 11]. The environmental consequences of urbanization are discussed in this paper, followed by the role of cities in human development and comfort. In the end one must make cities sustainable that can provide the latter while reducing environmental impacts. Such a venture would have to be a trans and multi-disciplinary effort

One way to create sustainable cities is to invest in urban agriculture. According to National Geographic (<http://environment.nationalgeographic.com/environment/photos/urban-farming>) "More people around the world are taking a look at urban farming, which offers to make our food as "local" as possible. By growing what we need near where we live, we decrease the "food miles" associated with long-distance transportation. We also get the freshest produce money can buy, and we are encouraged to eat in season.

Another benefit of urban farming is that it can add greenery to cities, reducing harmful runoff, increasing shading, and countering the unpleasant heat island effect. Garden plots can help people reconnect with the Earth, and gain a greater appreciation for where our food comes from."

Sustainability and Urban Ecology is a contemporary interdisciplinary field of study that can address the issues of sustainability, urban environment, climate change, and biodiversity conservation. Additionally, Sustainability and Urban Ecology at HSSU provides an opportunity to enhance STEM and technological skills in the minority and underserved population. HBCUs are in a position where they can provide African-American students with the wherewithal to commit to science programs at the undergraduate level. They provide a nurturing and familial relationship (Fleming, 1984; Freeman, Rouland, Winston et al., 2011) through the encouragement from faculty, staff, and administrators (Kim & Conrad, 2006; Palmer & Gasman, 2008).

Marybeth Gasman (Chronicle of Higher Ed. 2010, 'Bolstering African-American Success in the STEM Fields') discusses successes of African-Americans in STEM fields. Most of the African-American students pursuing graduate degrees in STEM fields arise from undergraduate

HBCU institutions. These institutions and the few HWI's that have had these successes foster a community among STEM students, provide ample hands-on research opportunities and incorporate issues of importance to the Black-Community into the learning. Sustainability and Urban Ecology is a field that can address these needs. It is highly interdisciplinary and can allow for related projects in diverse fields, allowing for group learning outside the classroom. Students can group with friends and colleagues outside their departments and work on a common themed project and unique and effective learning communities can be created.

Environmental degradation hits underserved urban communities hard. As Van Jones ('Green Collar Economy' 2009) discusses a green economy has the potential to solve environmental issues together with issues of poverty. No longer are environmental concerns just about the polar icecaps melting, and disappearing rainforests but about the reality of urban poverty and childhood asthma, lack of fresh food, nutrition, and pollution. Three of the five largest commercial hazardous waste landfills in the United States are located in predominantly Black or Hispanic communities.

A degree in Sustainability and Urban Ecology will be able to deliver hands on research opportunities and service learning projects, while simultaneously incorporating issues of importance to minority communities. This degree will deliver STEM learning both through coursework and the use of technology to underserved groups.

Michelle Asha Cooper the president of the Washington, D.C.-based Institute for Higher Education Policy. (Forbes, 2009, 'Closing The STEM Gap') discusses the need to increase STEM enrollments to retain America's leadership and innovation. The desired increase can only come by focusing on under-represented minorities especially with people of color in the US poised to become a majority by 2050 and the nation's colleges should be prepared to represent this diversity. The current rate of completion for non-Asian minorities is lower than that of their white counterparts. In STEM areas the completion gap is wider with only 42% African-American, and 49% Hispanics graduating versus 70% for White students. To close the gap, at the college level one must have access to technology through their curriculum. An Urban ecology degree will provide such an opportunity.

The role of Urban Ecology in encouraging high school students to consider STEM careers has already been demonstrated through a project launched by Boston University (Boston Chronicle, 2010, 'NSF Lauds Urban Ecology Project'). An Urban Ecology college degree will give students exposure to contemporary technological and statistical skills, content in STEM areas, and opportunities for urban internships and service learning projects, to prepare them for careers in urban environments

The urban green sector is growing, and HSSU because of its location and student population profile is in a position to contribute. Sustainability and Urban Ecology is a field that studies the unique problems of urban societies and explores finding long-term solutions to these problems. In an urban school with a largely urban population of which a large percentage belong to underserved minorities it offers a way to introduce these populations to scientific, computational, and technological tools, through a study of issues they can relate to. Sustainability and Urban Ecology as an academic field offers an opportunity to create unique learning communities across disciplines and it will enhance STEM programs at HSSU.

Harris-Stowe State University is well suited to create a Sustainability and Urban Ecology degree. With a diverse faculty profile that is accustomed and committed to collaboration, HSSU is in a position to deliver this unique interdisciplinary degree while simultaneously enhancing STEM and technological skills in under-served populations. Internships in Urban ecology can be

part of personal science experiences that can enhance such learning. The Missouri Botanical Garden, The St. Louis Zoo, the Danforth Plant Science Center, and the HSSU Center for Neighborhood Affairs are among the venues of possible internships for Urban Ecology majors in Saint Louis.

5. Address program duplication and opportunities for collaboration (*should include Form CL for collaboration*)

An increased interest in sustainability has resulted in schools like Missouri University of Science and Technology and Webster University offering a Sustainability minor. Many area schools have an environmental science or ecology degree programs. The degree program in Sustainability and Urban Ecology is uniquely designed with the view of particularly studying the ecology of urban environments and meshing it with sustainability. It also gives students the opportunity to acquire computational and statistical computing skills and even get a concentration in the field in a computational area.

6. PROGRAM STRUCTURE

A. Total credits required for graduation: 120

B. Residency requirements, if any: final 30 credit hours

C. General education: Total credits: 43 + 2 hrs University Required Courses= 45 hrs.

To satisfy General Education requirements, students presently must take eight credit hours of science chosen from the natural and physical sciences. The requirement is stipulated as three credit hours in natural sciences and three credit hours in physical sciences, with one associated two-hour laboratory course. The Sustainability and Urban Ecology degree program has two areas of concentration. Irrespective of the area of concentration there is a core of 47-50 credit hours that has to be taken by all majors. Of these 47-50 hrs. up to 20 credit hours (includes a Biology lecture and laboratory course) can be taken as Gen. Ed. credits freeing up room for free electives.

Courses (specific courses OR distribution area and credits):

SUSTAINABILITY AND URBAN ECOLOGY DEGREE PROGRAM: (120 credit hours minimum)

3 Concentration Areas: (Science(BIO_CHEM), Urban Agriculture, and Computational and Physical Science)

Gen Ed: 43 credit hours

University Required Courses (Freshman Orientation, Conversational Spanish):

2 credit hours

CORE

*** Gen. Ed course, can be counted in gen-ed credits, not program-specific credits**

(New courses in bold)

Core Courses Taken as Part of Gen-Ed	Credits	Course Title
BIO0151*	3	Biology Survey (Lec.)
BIO0152*	2	Biology Survey (Lab.)
CHEM0255*/PHY0251*/PHY0253*	3	General Chemistry/General Physics Mechanics (Alg. based/Calculus based)
GEOG0200*	3	Principles of Geography
MATH0150*/MATH0250*	3	Introduction to Statistics and Probability/Statistics and Data Analysis
POSC0200*	3	American Government Survey
SOC0100*/EON0203*	3	Introduction to Sociology/Microeconomics
Core Gen-Ed Course Total	20	

Additional Core Courses	Credits	Course Title
BIO0153	3	Biology Survey II (Lec.)
BIO0154	2	Biology Survey II (Lab.)
BIO02XX	3	Introduction to Sustainability
BIO0313	3	Environmental Science
BIO0324	3	Environmental Policy
BIO049X	3	Senior Synthesis in Sustainability and Urban Ecology
GEOG0401	3	Geographic Information Systems(**GEOG0200)
MATH0165/MATH0135	5/4	PreCalculus/College Algebra
MATH0170**/MATH0203	5/3	Calculus and Analytic Geometry I(**MATH 0165* or (**MATH 0135* and MATH0140*)) /Applied Calculus(**MATH0135/MATH0136/MATH0165)
Additional Core Course Total	27-30	

notes: -Computational and Physical Science Concentration Students have to take

PHY0252/PHY0253 and MATH 0165 as part of the core

-Students in the Computation and Physical Sciences concentration must take CSC 0233 or other programming course with departmental approval as part of their Skills' Offerings

+ 'Skills' Offerings: **9-10 hrs.**

+ Chosen Concentration: **15-19 hrs**

+ Other Concentration and/or Policy and Business Electives: **8-9 hrs**

Free Electives: **7-16 hrs**

Sustainability and Urban Ecology: Science (Biology-Chemistry) Concentration

(New courses in bold)

***Indicates that the course can be taken as part of Gen-Ed credits**

**** Indicates prerequisites required, students can choose to take the prerequisite courses as part of the Required Courses or Electives listed in this concentration**

Required Courses

Course Number	Credits	Course Title
BIO0303	3	Ecology (Lec.)
BIO0311	2	Ecology (Lab)
BIO0316	3	Urban Ecosystems (Lecture)
BIO0317	2	Urban Ecosystems (Lab)

Electives (5-8 hrs from the following at least 3 hrs at 300-400 level)

Course Number	Credits	Course Title
BIO0201	3	Plants and People

BIO 0202	3	Cell Biology
BIO0203	3	Nutrition
BIO0224	3	Ornithology
BIO0230	3	Local Flora
BIO0312	3	Microbiology (Lec.) (** BIO0202, ** <i>Concurrent enrollment:</i> BIO0332)
BIO0318	3	Urban Health Science
BIO0332	2	Microbiology (lab) (**BIO0202 , ** <i>Concurrent enrollment:</i> BIO0332)
BIO0402	3	Conservation Biology(**BIO0303 & BIO0311)
BIO0490	1-3	Topics in Biology
Chem0256	3	General Chemistry II (Lecture)
Chem0257	2	General Chemistry II (Lab)
CHEM030X	3	Environmental Chemistry (**CHEM0255*, **CHEM0256, **CHEM0257)

Sustainability and Urban Ecology: Urban Agriculture Concentration

(New courses in bold)

****Indicates that the course can be taken as part of Gen-Ed credits***

***** indicates prerequisites required, students can choose to take the prerequisite courses as part of the Required Courses or Electives listed in this concentration***

Required Courses

Course Number	Credits	Course Title
BIO2XX	3	Field work in Sustainable Urban Agriculture Production.
BIO2XX	2	Current trends in urban agriculture and the Edible Landscape
BIO0316	3	Urban Ecosystems (Lecture)
BIO0317	2	Urban Ecosystems (Lab)

Electives (5-8 hrs from the following at least 3 hrs at 300-400 level)

Course Number	Credits	Course Title
BIO1XX	3	Seasonal Production and Food Preservation
BIO200	3	Botany
BIO0201	3	Plants and People
BIO0203	3	Nutrition
BIO2XX	3	Principles of Horticulture
BIO2XX	3	Green House Management/Operation/Hydroponic Gardening
BIO2XX	3	Diagnosing and treating disease in urban agriculture
BIO0318	3	Urban Health Science
BIO0303	3	Ecology (Lec.)
BIO0311	2	Ecology (Lab)
BIO0490	1-3	Topics in Biology

Sustainability and Urban Ecology: Computational and Physical Science Concentration

(New courses in bold)

****Indicates that the course can be taken as part of Gen-Ed credits***

***** indicates prerequisites required, students can choose to take the prerequisite courses as part of Gen-Ed, Required Courses, Skills Offerings, or Electives listed in this concentration***

Required Courses

Course Number	Credits	Course Title
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PHY0304	3	Energy Science (Lecture)(** (PHY0251*/PHY0253* and Math0170*/Math0203*))
PHY0305	2	Energy Science (Lab) (** <i>concurrent enrollment</i> PHY0304)
MATH0301	3	Bio-Statistics (**MATH0150/**MATH0250)
MATH04XX	3	Mathematical Modeling In Urban Ecology (**MATH0170/MATH0203, **MATH0301, *, **CSC0233)

Electives (6-8 hrs from the following) ** indicates prerequisite

MATH0201	3	Discrete Math. I(**MATH0135*/**MATH0165*)
MATH 0315	4	Discrete Math II (**MATH0201)
MATH0330	3	Mathematical Probability
MATH0350	3	Topics in Applied statistics (**MATH 0250* and **MATH 0356)
MATH0356	3	Linear Algebra 1(**MATH0170*)
MATH0241	5	Calculus and Analytic Geometry II (**Math0170*)

Sustainability and Urban Ecology: Policy and Business Electives

***Indicates that the course can be taken as part of Gen-Ed credits**

**** indicates prerequisites required, students can choose to take the prerequisite courses as part of Gen-Ed,**

Required Courses, or courses included in this list of Policy and Business Electives

Course Number	Credits	Course Title
URST0301	3	The City (**SOC0100*)
URST0302	3	Urban Agenda (**URST0301)
URST0310	3	Megatrends and the Future of the City(**URST0301)
URST0400	3	Urban Planning (**URST0301)
URST0410	3	Urban Development (**URST0301)
POSC0380	3	Public Policy (**POSC0200*)
POSC0390	3	Urban Politics (**POSC0200*)
BIO0323	3	Ecological Economics (**ECON 0203* or ECON 0204*)
RM0301	3	Research Methodology and Statistics (**MATH 0135*)
SOC0310	3	Urban Sociology (**SOC0100*)
BSAD0220	3	Legal Environment of Business
BSAD0225	3	Diversity and Business Ethics
BSAD 0302	3	Entrepreneurship
HCM0300	3	Health Care Systems
HCM0400	3	Health Care Law and Ethics (**HCM0300)

Sustainability and Urban Ecology: Skills Offerings

Course Number	Credits	Course Title
CSC0233	3	Introduction to C# Programming (may be required for Computational Concentration)
BIO04XX	2-3	Internship in Sustainability
MATH0255	1	Introductory Statistics Lab
MATH0336	3	Statistical Computing
MIS0207	3	Object-Oriented Programming
MIS0310	3	Introduction to Computer Graphics (**MIS0207)
MIS0311	3	Advanced Computer Graphics (**MIS0207)
RM0432	2-3	Grant Writing and Administration
RM0302	3	Research Design and Statistics II

Major requirements: Total credits: 59-68 (including program electives)

E. Free elective credits: 7-16

(Sum of C, D, and E should equal A.)

F. Requirements for thesis, internship or other capstone experience:

3 credit hrs__in__**BIO049X: Senior Synthesis in Sustainability and Urban Ecology**. Additionally students have the option to choose BIO04XX 'Internship in Sustainability' as part of their skill electives.

G. Any unique features such as interdepartmental cooperation:

This degree is highly interdisciplinary offering a choice of one of two concentration areas (Science (Biology and Chemistry) or Computational and Physical Science). Course requirements include taking a minimum of 8 credit hours outside in either of or a combination of the other concentration area and Policy and Business electives.

Additionally, free electives allow one to pursue broadening of one's experience in different areas should one be so inclined.

Certificate in Urban Agriculture 14 credit hours

Required Courses (Courses in bold are new courses)

Course Number	Credits	Course Title
BSAD302	3	Entrepreneurship
BIO04XX	3	Internship in Sustainability
BIO2XX	3	Field work in Sustainable Urban Agriculture Production
BIO2XX	2	Current trends in urban agriculture and the Edible Landscape

Required Electives (3 credit hours from the following)

BIO2XX	3	Green House Management/Operation/Hydroponic Gardening
BIO2XX	3	Diagnosing and treating disease in urban agriculture
BIO1XX	3	Seasonal Production and Food Preservation
BIO2XX	3	Principles of Horticulture

8) PROGRAM CHARACTERISTICS AND PERFORMANCE GOALS

Institution Name Harris-Stowe State University
Program Name Sustainability and Urban Ecology B.S.
Date SPRING 2015

(Although all of the following guidelines may not be applicable to the proposed program, please carefully consider the elements in each area and respond as completely as possible in the format below. Quantification of performance goals should be included wherever possible.)

1. Student Preparation

- Any special admissions procedures or student qualifications required for this program which exceed regular university admissions, standards, e.g., ACT score, completion of core curriculum, portfolio, personal interview, etc. Please note if no special preparation will be required.

The students will have to have a minimum of 2.0 in each course that counts towards graduation in their concentration area. Students in the program have to maintain an overall GPA of 2.0 or better to continue.

- Characteristics of a specific population to be served, if applicable.
We are an open enrollment school and much of our population is from the underserved minority.

2. Faculty Characteristics

- Any special requirements (degree status, training, etc.) for assignment of teaching for this degree/certificate.
Full-time faculty members will have PhDs and be approved for faculty status by Harris-Stowe State University. If conditions warrant the need for adjunct faculty, and/or instructors they will be appointed having been approved for adjunct/instructor faculty status.
- Estimated percentage of credit hours that will be assigned to full time faculty. Please use the term "full time faculty" (and not FTE) in your descriptions here.
70-80%
- Expectations for professional activities, special student contact, teaching/learning innovation.

Service learning will be part of some of the curriculum and internship opportunities will be made available. Students will be involved in research (Senior Synthesis in Sustainability and Urban Ecology) with faculty and will get training in GIS. They will also be able to learn programming/statistics/grant writing as part of a skills set in the program.

3. Enrollment Projections

STUDENT ENROLLMENT PROJECTIONS

Year	1	2	3	4	5
Full Time	2	10	20	30	40
Part Time	3	3	6	6	6
Total	5	10	26	36	46
FTE	3	11	22	32	42

There are students in Harris-Stowe's Biology program who are interested in urban ecology even among Biology degree students without a minor. While an overwhelming number

of Biology students enroll planning to earn a minor in Pre-Med, it is becoming increasingly obvious this career choice is often due to familiarity than with real interest in medicine and medical-related fields. There have been discussions and workshops on diverse careers in STEM and many pre-medicine minors are realizing that a medical career is not their main interest. It is expected that these students and some other biology majors (4%-7% students) will be recruited into the Sustainability and Urban Ecology degree program. This will not significantly impact the Biology enrollment numbers, as there are a large number of Biology students but will give students in Biology an alternative option from pre-medicine. A growing interest in sustainability will assist in the institution's recruitment efforts. It is expected that the institution's recruitment efforts to earn high yields by the 3rd year of the inception of the program. The added incentive for students will be that they will acquire computational and statistical skills through the program. This too will help recruit students in the program. Students with an interest in ecology who are interested in computation will have the option of pursuing an urban ecology degree with a computational concentration. The growing interest in urban gardens and local farming will attract hobbyists, enthusiasts and members of the workforce to get a urban-agriculture certification, or even get a degree with a concentration in urban-agriculture concentration. A sustainability grant from UNCF in 2010 allowed HSSU to have a summer sustainability effort that was very successful. This shows a general favorable climate on campus for programs like Sustainability and Urban Ecology. The expectation is that the institution will have a yearly average of at least 10 students graduating from the 7th year after inception.

- **Percent of full time and part time enrollment by the end of five years.**
Full Time: 37/43=86%, Part Time: 6/43=14 %

4. Student and Program Outcomes

- *Number of graduates per annum at three and five years after implementation.*
10
- *Special skills specific to the program.*
Students will learn and use GIS and data analysis as well as do a research paper. They have options to learn programming and /or statistics and/or Grant Writing and/or do an internship in urban ecology off site as well.
- *Proportion of students who will achieve licensing, certification, or registration.*
NA
- *Performance on national and/or local assessments, e.g., percent of students scoring above the 50th percentile on normed tests; percent of students achieving minimal cut-scores on criterion-referenced tests. Include expected results on assessments of general education and on exit assessments in a particular discipline as well as the name of any nationally recognized assessments used.*
A nationally normed exit exam will be given to students. Initially it will be used for statistical purposes but will become a part of the program by fall 2016. that will be weighted in down the road.
- *Placement rates in related fields, in other fields, unemployed.*
80%, 20%, 0%
- *Transfer rates, continuous study.*
Harris-Stowe has articulation agreements with St. Louis Community College and Kansas City's Metropolitan Community College System. It is expected that Harris-Stowe's

transfer rates will increase significantly as Harris-Stowe aggressively market the program and recruit transfer students into the program.

5. Program Accreditation

- *Institutional plans for accreditation, if applicable, including accrediting agency and timeline. If there are no plans to seek specialized accreditation, please provide a rationale.*

HSSU accreditation is through the Higher Learning Commission. Sustainability and Urban ecology is a highly interdisciplinary and fairly new field. Most of the courses are part of current programs. It was determined that at this time that Harris-Stowe does not see a specialized accreditation.

6. Alumni and Employer Survey

- *Expected satisfaction rates for alumni, including timing and method of surveys.*

90+%. There will be an initial survey conducted just prior to graduation with follow up surveys 6 months, 2.5 years, and five years after graduation.

Currently the career center does an initial survey of graduates asking if they have been placed just prior to graduation. Their email, addresses and contact numbers are requested and 6 months later they are contacted to see how they are doing. Questions include salary, company names, graduate school enrollment, and undergraduate degree and major. In our six month, 2.5 year and five year surveys we will include questions about how they feel about their place and kind of work they do and how it is related to their undergraduate degree as well as a list of recent jobs.

Sample survey:

Name:

Address:

Phone:

Email Address:

Degree/Major

Concentration Area

Graduation Semester/Year

Did you do an Internship for your undergraduate and if so where?

Employment Status:

Company Name:

*What is the salary range?**

<\$20000/year

\$20000-\$25000

\$25000-\$30000

\$30000-\$35000

\$35000-\$40000

\$40000-\$45000

>\$45000

** This will be used for statistical purposes only and will be kept confidential.*

How long have you been in your current position?

Previous jobs post-graduation?

How long after graduation did you receive employment?
Did you need a Bachelor's degree for your current job?
Is your current job related to your undergraduate degree? (give details)

How happy are you in your current position

Are you or have you attended graduate school?
If so what are/were you majoring in?
Date of graduation/expected graduation:
Is your major related to your undergraduate degree?

Comments

- Expected satisfaction rates for employers, including timing and method of surveys.

90+%. We will do surveys 6months, 2.5 years, and 5 years after graduation. Currently the Education department gets information from employers and the Business school does contact the employers of their graduates and survey them. The Science and Math departments are beginning to prepare their surveys. We would contact companies, businesses, and universities in the Saint Louis area and possibly outside for information on how our graduates do as employees.

7. Institutional Characteristics

- ***Characteristics demonstrating why your institution is particularly well equipped to support the program.***

As an urban university in the heart of Saint Louis, Harris-Stowe is in a unique position to establish a degree program in Sustainability and Urban Ecology, a field of growing interest in the community. Harris-Stowe is perfectly suited, by location and design to offer this degree program. HSSU is in an urban location whose students are largely from urban areas.

Sustainability and Urban Ecology is a highly inter-disciplinary field. Not only, does it require the interfacing of different STEM areas, it must also include non-STEM courses in urban-studies, business, and geography. Harris-Stowe is a moderate size university where such collaborations can occur naturally. The Social and Behavioral Department, Science and Math Departments, as well as the business school are housed in the same building. A stone's throw away is the Education department. The strong education program was the mainstay of the school for many years. The science, math, and urban studies departments, provided content instruction to elementary, middle, and secondary education students. All departments were involved in NCATE accreditation related activities. Even, as we have diversified and included more recent degree programs like Biology and Mathematics, beyond the Science and Mathematics education programs, the collaborative experience we had over the years allows us to deliver this uniquely inter-disciplinary program. In fact we have been able to piece together different courses we

already offer in different departments and with a few additions, provide a format for an Urban Ecology degree program. HSSU has a strong Urban Studies department, and we already have a minor in Urban Ecology as part of the Biology degree program. We are located in the heart of the city and our students are largely drawn from the city. Since Sustainability and Urban Ecology is very much about cities, their own peculiar problems, the built environment, and their sustainability, HSSU can be at the center of this enterprise.

Additionally Sustainability and Urban-Ecology offers a way to create unique learning communities with cross-disciplinary projects. In a smaller school the interface between students in diverse fields can be more easily established to create learning communities amongst students in different areas for mutual benefit. Projects in Sustainability and Urban Ecology would often involve studying urban issues like housing and greening of urban spaces, and opportunities for internships would be available in the vicinity of HSSU for example the botanical garden, ecological projects involving the Mississippi river, and the HSSU Center for Urban Affairs.

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<http://www.cuny.cuny.edu/sustainability/jobs.cfm>
- (6) <http://www.npr.org/player/v2/mediaPlayer.html?action=1&t=1&islist=false&id=1312622&m=1312623> **THIS IS A VERY INTERESTING TALK ON SYNTHESIZING DIFFERENT FIELDS INTO URBAN ECOLOGY.)**
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COURSE DESCRIPTIONS

CORE:

SOC0100 INTRODUCTION TO SOCIOLOGY

3

This course surveys the range of human cultural variation and differing patterns of human social relationships. The perspectives and concepts of anthropology and sociology presented in this course will prepare the student to recognize and appreciate the variety of social and cultural situations encountered in life.

BIO 0151 BIOLOGY SURVEY (Lecture)

3

Prerequisite: One year of high school biology or its equivalent

BIO 0151 and BIO 0152 together form a five- semester credit hour lecture-laboratory course in general biology that focuses on three theories: cell theory, gene theory and evolution theory. The courses do not have to be taken concurrently, although that is recommended for Biology and Teacher Education majors. The course introduces students to the principal concepts, ideas and developments in the biological sciences to provide a sound and general basis for understanding information, principles and concepts related to scientific inquiry, the nature of matter and energy transfer, cells, heredity, aspects of reproduction and development, the origin, evolution, and diversity of life. (F/SP/SU)

BIO 0152 BIOLOGY SURVEY (Laboratory)

2

BIO 0152 provides hands-on experience with the fundamental concepts and principles encountered in the lecture part of Biology Survey. The processes of science are emphasized such as observing, designing experiments, refining techniques and presenting and interpreting the results of findings. Basic laboratory techniques and safety are stressed.

(F/SP/SU)

BIO 0153 BIOLOGY SURVEY II (Lecture)

3

Prerequisite: Grade of C or better in BIO 0151 & BIO 0152

Concurrent enrollment: BIO 0154

In BIO 0153/0154 the base concepts learned in BIO 0151/0152 are synthesized and applied as they relate to the diversity of living things at an organismal level. This course surveys the major life forms, stressing the organization, evolution and adaptation, phylogeny, reproduction and ecology of eukaryotes, including protists, fungi, plants and animals. Includes a brief overview of vertebrate physiology and evolution, including humans. This course is a prerequisite for most other biology courses. (F/SP/SU)

BIO 0154 BIO SURVEY II (Laboratory)

2

Prerequisite: Grade of C or better in BIO 0151 & BIO 0152

Concurrent enrollment: BIO 0153

Laboratory experiences in this course are designed to provide hands-on experience with the fundamental life forms, concepts, and principles encountered in the lecture part of Biology Survey II. This course is a prerequisite for most other biology courses(F/SP/SU)

^BIO 03XX INTRODUCTION TO SUSTAINABILITY

3

MATH 0150 INTRODUCTION TO STATISTICS AND PROBABILITY 3

Prerequisite: ALG 0038 or Evidence of college-level readiness in MATH

This course includes a general introduction to descriptive and inferential statistics. Topics to be covered include: measures of central tendency and dispersion, linear correlation and regression, sampling distributions, confidence intervals, and hypothesis testing. Students intending to take further MATH courses in statistics besides MATH 0301 should take MATH 0250 instead of MATH 0150. Students are highly encouraged, but not required, to enroll concurrently in MATH 0255.

MATH 0250 STATISTICS AND DATA ANALYSIS 3

(Formerly: Inferential Statistics)

Prerequisite: Grade of C or better in MATH 0165 or departmental approval.

MATH 0255 must be taken concurrently. This course serves a general introduction to descriptive and inferential statistics and data analysis. It covers material similar to MATH 0150 but from a more mathematically sophisticated point of view. Students intending to take further MATH courses in statistics besides MATH 0301 should take MATH 0250 instead of MATH 0150.

GEOG0200 PRINCIPLES OF GEOGRAPHY 3

This course is a survey of the physical processes acting on the earth's terrain and man's role of interaction with and perceptions of his environment. The survey covers a broad range of topics within the areas of physical and cultural geography, including basic geology, climate, world regions, population and environmental problems.

ECON0203 MICROECONOMICS 3

Prerequisite: ECON 0201

This course covers topics in pricing and output, competition and monopoly, government regulation, institutions, market specialization exchange and other related topics. (F)(S)

ECON0203 MICROECONOMICS 3

Prerequisite: MATH 0203

This course covers topics in pricing and output, competition and monopoly, government regulation, institutions, market specialization and exchange and other related topics. (F)(S)

BIO0313 ENVIRONMENTAL SCIENCE 3

Prerequisite: Grade of C or better in BIO 0151 & BIO 0152

Students will understand how humans interact with nature in the areas of resource use, conservation and their global environmental impact. Course includes study of ecosystems and their services, geochemical cycles, biodiversity, overviews of population and community ecology and resources such as water, soil, minerals, wildlife and energy. Discussion topics include resource management, food production, human population dynamics, energy issues, and global issues such as climate change, loss of biodiversity, pollution and deforestation. This course combines content previously offered as two 2 hour courses, BIO 0304I and BIO 0304II (Environmental Science I/II).

BIO0324 ENVIRONMENTAL POLICY 3

This course deals with actions and politics of managing human activities to prevent, reduce, or mitigate harmful effects on nature and quality of life. Environmental issues such as protection of natural resource and biodiversity, air and water pollution, climate change, and waste management are among the topics addressed. Formulation of policies on the basis of sustainability, equity, human rights, risk assessment, and polluter accountability is discussed.

GEOG 0401 GEOGRAPHIC INFORMATION SYSTEMS 3

This course is an introduction to the use of Geographic Information Systems software. Students will learn how to map out data stored in spreadsheet and database files and its application to business, criminal justice and demographic analysis.

^BIO049X: Senior Synthesis in Urban Ecology and Sustainability

Prerequisite: Senior standing

A capstone course required for UE majors that provides the student the opportunity for in-depth study in UE, consisting of either a research project, research paper, under HSSU faculty.

CHEM 0255 GENERAL CHEMISTRY (Lecture) 3

Prerequisite: MATH 0135 or MATH 0136 (or its equivalent)

This course is structured to provide a general background or knowledge base in chemistry, both theoretical as well as descriptive, including topics such as properties of matter, atomic theory, periodic arrangement, chemical bonds, states of matter, oxidation-reduction, acids and bases. The scientific method is discussed as applied to the chemical sciences. It is appropriate as a first course in chemistry for those who want to continue their study of chemistry and for those who want to broaden their knowledge of the sciences. (F/SU)

Prerequisite as part of gen. ed

***PHY 0251 GENERAL PHYSICS: MECHANICS (Lecture) 3**

Prerequisite: MATH 0135/MATH0165

PHY 0251 is a general physics course which has its main emphasis on mechanics. Among the topics studied are vectors, kinematics, Newton's laws of motion, torques, momentum, work, and energy. Although Physics 0251 often takes a conceptual approach to its topics, a quantitative treatment of the subject is maintained throughout with example problems being demonstrated by the instructor and homework problems being assigned. Instructional activities consist of lectures, class discussions, demonstrations and some use of audio-visual materials. (F)(SU)

PHY 0253 GENERAL PHYSICS: MECHANICS –Calculus Based (Lecture) 3

Prerequisite: MATH 0170

PHY0253 is a general physics course which has its main emphasis on mechanics. Among the topics studied are vectors, kinematics, Newton's laws of motion, momentum, work, and energy, rotation and torques, equilibrium, waves and oscillations, basics of heat and thermodynamics. The objective of this course is to learn the principles of mechanics and to develop the problem solving skills needed to apply these principles to physical systems. These will include physical systems with continuous distributions of mass that require the use of calculus. (F)(SU)

SCIENCE (BIOLOGY-CHEMISTRY) CONCENTRATION COURSE DESCRIPTIONS

Required Courses**BIO0303 ECOLOGY 3**

Prerequisite: Grade of C or better in BIO 0153 & BIO 0154

Concurrent enrollment: BIO 0311 (except Middle School Education: Natural Science option majors)

BIO 0303 studies how organisms live and interact with their biotic and abiotic environment. Autecology and synecology are studied in detail, including natural selection, species interactions, population and community structure and species diversity. This course is required for candidates completing the Middle School Education: Natural Science option, who are not required to enroll in the lab. (F)

BIO0311 ECOLOGY (Laboratory) 2

Prerequisite: Grade of C or better in BIO 0153 & BIO 0154

Concurrent enrollment: BIO 0303

This laboratory course reinforces and complements the lecture topics presented in BIO 0303, Ecology, which must be taken concurrently. Concepts covered in lecture are brought to life in practical and hands-on experiences, including field trips, sampling techniques, data analysis and mathematical modeling. (F)

This course explores the interactions between the biotic and abiotic components of urban and suburban areas and focuses on understanding basic ecological dynamics relating to urban environmental issues. Topics discussed include landscape ecology, urban flora and fauna and their adaptations, restoration ecology, microclimate, and pollutant effects on quality of life. Concurrent enrollment in BIO 0317 is recommended but not required. (F)

BIO0317 URBAN ECOSYSTEMS (Laboratory) 2

Prerequisite: Grade of C or better in BIO 0303 & BIO 0311

Concurrent enrollment: BIO 0316

This laboratory complements the urban ecosystems lecture class which must be taken concurrently. Lab assignments include experiments, field trips, and projects using mapping and software modeling programs. (F)

Required Electives (14-16 credit hours. At least 5 credit hours at 300-400 levels)

BIO0201 PLANTS AND PEOPLE 3

This course examines economically important plants and explores the link between plants and people. Specific objectives include understanding the history of plant use including origins of economically important plants, and the use of flowers, fruits, roots, stems and leaves for food, clothing, shelter, medicine and other purposes. The course will convey and foster understanding of the major principles and concepts of economic botany and its influence on scientific and cultural issues of the society.

BIO0202 PRINCIPLES OF CELL BIOLOGY 3

Prerequisite: Grade of C or better in BIO 0151 & BIO 0152. BIO 0141 may be substituted for 0151 with a grade of B or better and departmental permission.

This course provides an overview of the structure and function of cells and their subcellular and molecular components. Topics covered include membrane dynamics, cellular compartmentalization, protein construction and trafficking, mitochondrial and chloroplast function, cell signaling pathways, cell reproduction, information storage and processing, and gene regulation. This course prepares students for more advanced courses in biology and is a prerequisite for most of the advanced courses. (F/SP/SU).

BIO0203 NUTRITION 3

This is an introductory course about the necessary food nutrients and their relation to human health. The course covers the types, sources, and metabolic function of food nutrients. Other topics include variation in normal and specialized diets, malnutrition, alcohol use, eating disorders, building nutritional health skills and choices, and healthy weight management.

Students will analyze their own eating habits over the semester. This course is required for students who will transfer or continue to a nursing program.

BIO0224 ORNITHOLOGY 3

Prerequisite: Grade of C or better in BIO0153 & BIO 0154 or departmental permission

This course introduces the students to the biology of birds. Through lectures and field studies, students will understand the evolution, flight, migration, reproduction, ecology and conservation of birds. The field trips will focus on bird identification of birds of Missouri at local conservation areas, and examination of captive species from all over the world at the St. Louis Zoo and the World Bird Sanctuary. (SP/SU)

BIO0230 LOCAL FLORA 3

Prerequisite: BIO 0151 & BIO 0152, or departmental permission.

BIO 0153 & BIO 0154 are recommended.

BIO 0230 is a study of the taxonomy and systematics of the vascular plants, with emphasis on the plants and flowers of Missouri, including their names and uses. Local field trips are an important part of the course for study and field identification. (SU/F)

BIO0312 INTRODUCTION TO MICROBIOLOGY 3

Prerequisite: Grade of C or better in BIO 0202

Concurrent enrollment: BIO 0332

BIO 0312 is an introduction to the study of microorganisms with an emphasis on bacteria and their broader impacts on the environment, biotechnology and industry, and human health. (F)

BIO0318 URBAN HEALTH SCIENCE 3

This course focuses on how the urban structure and lifestyle affects human health and well-being. Underlying causes of special public health concerns will be discussed that relate to the development of cities, such as the export of waste, trans-boundary emissions, and pollutant flows. (SP)

BIO0332 MICROBIOLOGY (Laboratory) 2

Prerequisite: Grade of C or better in BIO 0202

Concurrent enrollment: BIO 0312

This laboratory course reinforces and complements the lecture topics presented in BIO 0312 Introduction to Microbiology, which must be taken concurrently. Students will observe and culture microbes, especially bacteria, learn specific protocols for isolating, culturing, handling and studying microbes safely, practice sterile technique, and become familiar with basic laboratory instrumentation, including spectrophotometers and centrifuges. (F)

BIO0402 CONSERVATION BIOLOGY 3

Prerequisite: Grade of C or better in BIO 0303 & BIO 0311

This course addresses the problems of managing biological diversity in our rapidly changing world. Concepts from island biogeography, population biology, community ecology, systematics, and genetics are applied to real-world problems, including minimum viable population size and threats from global climate change, invasive species, and other human disturbances.

BIO0490 TOPICS IN BIOLOGY 1-3

Prerequisite: Permission of instructor or department.

May be repeated for credit.

BIO 0490 covers advanced specialized topics within the field of Biology. Specific topics may change based on the expertise of the faculty instructor.

CHEM 0256 GENERAL CHEMISTRY (Laboratory) 2

Prerequisite: MATH 0135 or MATH 0136 or its equivalent

This course is structured to supplement a general chemistry course (CHEM 0255) with instructions in the elementary techniques and safety procedures used in the chemical laboratory. The scientific method is discussed as applied to the chemical sciences. It is appropriate as a supplement to a first course in chemistry for those who want to continue their study of chemistry and for those who want to broaden their knowledge base of the sciences. (F/SU)

CHEM 0257 GENERAL CHEMISTRY II (Lecture) 3

Prerequisite: CHEM 0255 and MATH 0135 or its equivalent and concurrent enrollment in CHEM 0258

CHEM 0257 is a continuation of CHEM 0255 and is an introduction to quantitative analysis involving the basic theory of stoichiometry and topics such as chemical equilibrium, transition elements, oxidation-reduction, acid-base and nuclear chemistry. This course is suitable for those interested in a science major. (SP)

^CHEM030X Environmental Chemistry

Prerequisites: CHEM0255*, CHEM0256*, CHEM0257

This course, Environmental Chemistry (CHEM 030X), is an introductory study of the Chemistry of the environment. The principles of chemistry will be applied to enable students to gain an understanding of how the environment operates and how human activities affect it, and the relation of chemistry to society and ecological and environmental issues. Topics include acid rain, air pollution, fuels, green chemistry, greenhouse effects, global warming, ozone depletion, nitrates and phosphates and putrefaction of bodies of water, polychlorinated biphenyls (PCBs), and water pollution..

URBAN AGRICULTURE CONCENTRATION COURSE DESCRIPTIONS

Courses not in the Science (Biology-Chemistry) Concentration

^ BIO2XX Field-work in Sustainable Urban Agriculture Production 3

This course covers practical aspects of operating a small-scale urban farm. It includes hands-on instruction and an introduction to a range of related topics including composting and building fertile soil, irrigation systems, plant propagation, and pest management. Students will explore personal agricultural interests through individual projects. This course may include visits to local farms and gardens or the use of small plots of land to grow edible and/or ornamental crops. Specific garden activities will depend of the season of the year.

^BIO 2XX Current Trends in Urban Agriculture and the Edible Landscape 2

This course is a survey of current policies and practices in urban agriculture as well as an introduction to the historical, social and ecological foundations of urban agriculture. Students will assess the opportunities and challenges in contemporary urban agriculture. The course will also feature guest lectures by local professionals.

^BIO2XX Greenhouse Management and Aquaponics 3

In this course students are introduced to the technology used in production of greenhouse plants include heating and cooling, crop nutrition, and light control. This course provides the skills and concepts needed to operate a green house including both soil-based and soil-free methods of plant growth. The course also focuses on the biology of seeds and seedlings, seedling development, crop plant propagation, soil conditions and mixes, and disease management. Organic methods and healthy plant production are discussed.

^BIO1xx Seasonal Production and Food Preservation 3

This course introduces students to concepts surrounding food security through the practice of seasonal production and food preservation. This course is a hands-on study of cultural practices, varieties and economic of production of major season vegetable crops in the St. Louis Metro region. Topics will include seasonal strategies for sustainable crop production and marketing. In a time of energy descent, strategies for sustainable urban food production are needed. Canning, dehydrating, fermenting, and food preservation history are discussed.

^BIO2XX Diagnosing and treating disease in Urban Agriculture 3

This course is an introduction to methods used to identify and treat disease states in crops and animals associated with urban farming. Topics will include both prokaryotic and eukaryotic pests as well as both practical and regulatory considerations of pesticide use. State and federal regulations concerning pesticides will be discussed. Sustainable practices will be emphasized.

^BIO2XX Principles of Horticulture 3

This course introduces concepts of plant growth and development focusing on horticulture practices. Topics will include taxonomy, anatomy, morphology, physiology, and genetics of plants as applied to identification and both sexual and asexual propagation techniques. Environmental, hormonal and physiological factors affecting seed dormancy, germination, plant rooting and budding will be discussed.

COMPUTATION AND PHYSICAL SCIENCE CONCENTRATION COURSE DESCRIPTIONS

Prerequisites from Gen. Ed.

MATH0135 COLLEGE ALGEBRA 4

Prerequisite: ALG 0038 or Evidence of college-level readiness in MATH

The topics that will be covered in this course are graphs of equations, functions and their graphs, polynomial and rational functions, exponential and logarithmic functions, the conics, systems of equations, matrix algebra, sequences, counting techniques and probability. (F-A/E)(SP-A/E)

MATH 0140 TRIGONOMETRY(Formerly Math 0217) 3

Prerequisite: Grade of C or better MATH 0135 or a grade of B or better in a high school AP Calculus course.

Among the topics included in this course are trigonometric functions, angle measurements, solutions of triangles, trigonometric identities, circular functions and trigonometric equations.

(F)(SP)(SU)

Required Courses

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_____ **MATH0170 CALCULUS AND ANALYTIC GEOMETRY I 5**

Prerequisite: Grade of C or better in MATH 0165 or (MATH 0135 and MATH 0140) or departmental permission. Biology majors-see note.

This course covers basic analytic geometry, functions, limits, continuity, differentiation rules, derivatives of transcendental functions, and applications of differentiation. *Note that MATH 0170 satisfies the general education requirements in Mathematics.* Biology majors minoring in Pre-Medicine are not required to take MATH 0140 as a prerequisite, although it is recommended to do so.

OR

MATH 0203 APPLIED CALCULUS FOR BUSINESS MAJORS

Prerequisite: MATH 0135* OR MATH 0136* MATH 0203 introduces elementary analytic geometry, functions, graphs, differential and integral calculus with applications to various areas including business and economics. This course may not be taken as an alternative for MATH 0170.

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PHY304 ENERGY SCIENCE (Lecture)

Prerequisite: PHY 0251/PHY0253, MATH0170/MATH0203

This course discusses energy sources and their use in biological and physical processes. The students will be introduced to thermal processes, black-body radiation, climate models, solar energy, photo-voltaics,, non-imaging optics and solar heat collection, heat engines, thermodynamic efficiency, biofuels, and renewable energy, the built environment, including materials, shapes, and transportation. (S)

PHY0305 ENERGY SCIENCE (Laboratory) 2

Concurrent enrollment: PHY 0304

This course complements the lecture component of Energy Science, PHY 0304, which must be taken concurrently. It includes experiments and projects that deal with scientific processes, data collection, interpretation of results, and presenting findings. .

Energy Science Pre-requisite not in Gen .Ed. and not in Computational Concentration Area

MATH 0301 BIOSTATISTICS

3

Prerequisite: Grade of C or better in MATH 0150 or MATH 0250.

This course is designed to meet the needs of students pursuing various degree programs in Biological and Mathematical Sciences. The course will cover topics in both descriptive and inferential statistics with emphasis in biological sciences. Among the topics to be covered are one-sample and two-sample parameter inferences, experimental design, simple regression analysis, covariance and correlation, ANOVA, contingency tables, non-parametric techniques, and analysis of data using selected statistical software packages such as SAS, R, , Excel, and SPSS.

^MATH04XX MATHEMATICAL MODELING IN URBAN ECOLOGY 3

Prerequisites: **MATH0170, **MATH0301, **MATH0241, **CSC0233

This course will involve the use of stochastic, numerical, and spatial analysis to study urban ecological issues including transport modeling, development of urban housing and other systems, landscape change, and dispersal of pollutants.

Required Electives (8-10 credit hours):

MATH0201 DISCRETE MATHEMATICS 3

Prerequisite: Grade of C or better MATH 0135 or MATH 0165

This course is intended to provide an introduction to many of the discrete mathematics topics useful to the computer scientist and the mathematician. Topics include characteristics of the number system, sets and logic, proof methods, functions, and relations (with additional topics at the discretion of the instructor) (F)

MATH0242 CALCULUS AND ANALYTIC GEOMETRY III 5

Prerequisite: Grade of C or better in MATH 0241

This course concludes the Calculus sequence started in MATH 0170 and MATH 0241. Topics covered include vectors in 2- and 3-dimensional space, vector-valued functions, partial derivatives, multiple integration, line and surface integrals, and the major theorems of vector calculus. (F)

MATH0315 DISCRETE MATH II 4

Prerequisite: Grade of C or better in MATH 0201

This is a combined lecture/lab course which continues the study of discrete and combinatorial mathematics introduced in MATH 0201 and includes a lab component in which students use computational methods to study discrete math problems and concepts. Topics to be studied include induction and recursion, an introduction to combinatorics, the theory of graphs and trees, and analysis of the efficiency of algorithms.

MATH0330 MATHEMATICAL PROBABILITY 3

(Formerly: Continuous Probability Distributions)

Prerequisite: Grade of C or better in MATH 0201, MATH 0241, MATH 0250, and MATH 0356

Mathematical theory and application of probability at the advanced undergraduate level; a calculus based introduction to probability theory. Topics include the computational basics of probability theory, combinatorial methods, conditional probability including Bayes Theorem, random variables and distributions, expectations and moments, the classical distributions, and the Central Limit Theorem.

MATH0331 MATHEMATICAL STATISTICS 3

Prerequisite: Grade of C or better in MATH 0330

Theory of estimation, minimum variance and unbiased estimators, maximum likelihood theory, Bayesian estimation, prior and posterior distributions, confidence intervals for general estimators, standard estimators and distributions such as the Student-t and F-distribution from a more advanced viewpoint, hypothesis testing, the Neymann-Pearson Lemma (about best possible tests), linear models, and other topics as time permits.

MATH0350 TOPICS IN APPLIED STATISTICS 3

Prerequisite: Grade of C or better in MATH 0250 and MATH 0356

This course tackles practical problems in data analysis and will focus on selected topics in estimation, prediction, and hypothesis testing using real-world data. This course will also focus on the problems inherent in handling and cleaning data from real-world sources. Data analysis for this course will rely heavily on statistical software packages such as SAS, SPSS, and R.

MATH0356 LINEAR ALGEBRA I 3

(Formerly: MATH 0456: Introduction to Linear Algebra)

Prerequisite: Grade of C or better in MATH 0170

This course deals with operations on matrices, determinants, systems of linear equations, linear transformations and inner products. This course focuses primarily on Euclidean spaces. (F)

MATH0361 DIFFERENTIAL EQUATIONS 3

(Formerly: MATH 0461)

Prerequisites: Grade of C or better in MATH 0241 and MATH 0356

This course serves as an introduction to methods of solving ordinary differential equations. Topics covered include methods of solving first- and second-order ordinary differential equations with constant coefficients, power series methods, systems of first-order linear differential equations, and Laplace Transforms. (SP)

MATH0402 NUMERICAL ANALYSIS 3

Prerequisites: Grade of C or better in MATH 0242, MATH 0456 and MATH 0361

This course will deal with numerical analysis problems, error analysis, data approximation, differential calculus and numerical solutions of differential equations.

MATH0475 APPLIED MATHEMATICS I 3

Pre-requisites: Grade of C or better in MATH 0242, MATH 0356 and MATH 0361

This course will explore selected topics of applied mathematics. Potential topics include: Calculus of Variations, Fourier Series methods and Boundary Value Problems, the Fourier Transform, and an introduction to the theory of Partial Differential Equations.

MATH0336 STATISTICAL COMPUTING 3

Prerequisite: Grade of C or better in MATH 0250 and MATH 0255 and MATH 0356

This course addresses the use of the computer as a tool for solving statistical problems of reasonable size. Students will be introduced to the varieties of statistical software packages that are currently available in the market. Students will be guided to use some of these software packages and will learn how to interpret outputs and draw statistically prudent inferences. Examples of software packages that students will learn to use are SPSS, SAS, R, and Excel.

Policy and Business Electives

COURSE DESCRIPTIONS

URST0301: The City— Prerequisite: SOC 0100

This course is an overview of the evolution of urbanization and the current nature of cities. Topics include a discussion of what a city is, a description of forces leading to urbanization, early city cultures, an overview of major urban theorists and the impact of industrialization/post-industrialization on the city.

URST0302: Urban Agenda— Prerequisite: URST 0301

This course attempts to survey contemporary urban research methods. Topics include primary data collection, census analysis, and introduction to geographic information systems.

URST0310 Megatrends and the Future of the City

Prerequisite: URST 0301

This course attempts to identify the most significant technological, social, economic and political movements shaping the world today and their consequences for the future of urbanization. Topics to be discussed include the global market economy and new urban networks; race, class and edge cities; the information revolution and the role of cities and the urban impact of the demise of communism and the rise of nationalism.

URST0400: Urban Planning

Prerequisite: URST 00301

This course is concerned with the examination of the historical efforts to shape the city. Topics include the evolution of land use planning, urban revitalization and future directions in urban planning and development.

URST0410: Urban Development

Prerequisite: URST 00301

This course deals with issues concerning the built and economic environments of the American city. It attempts to provide an overview of development needs facing contemporary cities and potential strategies. Topics include developing urban development policy, equity, financing and governmental programs.

POSC0380: Public Policy

Prerequisite: POSC 0200

The course is concerned with the study of the social, political, and economic factors affecting the development and implementation of public policies. The course is constructed with three focal points or stages of policy creation: pre-policy conditions, policy design and policy implementation. Particular attention is given to the policy actors, their interests and values and their actions that affect the course of policy creation.

POSC0390: Urban Politics

Prerequisite: POSC 0200

This course is an analysis and discussion of the urban political structures in the U.S. It emphasizes political processes and policy implementation in a number of contemporary urban issues.

BIO0323: Ecological Economics

Prerequisite: ECON 0203 or ECON 0204

This course covers a disciplinary field of academic research that addresses the interdependence between human economies and natural ecosystems. It discusses how to operate an economy within the ecological constraints of Earth's natural resources. Ecological economics is defined by its focus on nature, justice, and time (per economist Malte Faber). Issues of intergenerational equity, irreversibility of environmental change, uncertainty of long-term outcomes and sustainable development guide ecological economic analysis and valuation. The possibility of jobs in the "green industry" will be outlined as a future of sustainable living. BIO 0323 or the following, BIO 0324, is required for students with the Urban Ecology minor.

RM 0301 RESEARCH METHODOLOGY AND STATISTICS

Prerequisite: MATH 0135 (Will be amended to allow MATH 0150)

This course has two focus points: research methodology and research statistics. The research methods purpose of this course is to introduce the student to elements of research

methodology as it is applied to various social issues. The second purpose of this course is to introduce the student to elements of qualitative research methodology as it is applied to various types of data.

ECON0204 MACROECONOMICS 3

Prerequisite: ECON 0203

This course covers topics in economic growth, income determination, aggregate demand and supply, employment and output, monetary and fiscal policies and other related topics. (F)(SP)

SOC0310: Urban Sociology— Prerequisite: SOC 0100

This course is designed to be a survey of contemporary urban social issues in a continuing process of the social historical development of the concept of urbanism and the separation of the phenomenon of urban life from the political concept of a city and the discipline's traditional analysis of the city. A second focal point is developed from the understanding of this social historical process; the examination of the dynamic interplay between what theoretical perceptions postulate about urban life and an analysis of the perception of how "ordinary" individuals view urban life. The construct of these two focal points is designed to investigate urban life, urban social interactions, urban patterns, urban institutions and the strategies that people use to create community and the transformation of such a community into an epi-community - a community that is secondary to another social issue or phenomenon.

BSAD0220 LEGAL ENVIRONMENT OF BUSINESS 3

This course covers the fundamental principles and concepts of law relative to business activity. The design is to provide the legal principles and concepts related to corporate, public/private owned, small and minority/women-owned businesses. Students will explore the origin of law, the classification of law, courts and procedures, torts, contracts, criminal law, negotiable instruments, secured transactions, bankruptcy law, employment law and employment discrimination, anti-trust law, real property law, environmental law and the impact of the Internet and technology on the law and related topics.

BSAD0225 DIVERSITY AND BUSINESS ETHICS 3

This course examines major ethical laws and moral considerations of corporate conduct and social responsibility as well as the complexities of managing a diverse workforce.

BSAD0302 ENTREPRENEURSHIP 3

This course covers the role and function of entrepreneurs and entrepreneurship in the free market economy. Students examine personal and commercial strategies to establish new business ventures and related topics.

HCM0300 HEALTH CARE SYSTEMS 3

This course studies the health care system including its historical beginning and forces that influence its organizational forms and financing, concerns molding its future and related topics. (F)(SU-OD)

HCM0400 HEALTH CARE LAW AND ETHICS 3

Prerequisite: HCM 0300

This course studies ethical issues in corporate, medical and health care settings. It emphasizes the legal and legislative process, legal terminology, legal reasoning with practical applications to health care management, health policy decisions, and related topics. (F)(SU-OD)

SKILLS REQUIRED ELECTIVES (2-3 credit hrs):

CSC 0223 INTRODUCTION TO VISUAL BASIC PROGRAMMING 3

Prerequisite: CED 0104

CSC 0223 introduces programming of Windows applications using Visual Basic. Topics include variables, data types, program control, procedures, forms and standard controls.

(SP)(OD/E)

CSC0233 INTRODUCTION TO C++ PROGRAMMING 3

Prerequisite: CED 0104 or CSC 0217

This course introduces programming using C++. Topics include variables, data types, program control, functions, arrays, structures and stream I/O. (FA-E)(SA)

CSC0323ADVANCED VISUAL BASIC PROGRAMMING 3

Prerequisite: CSC 0223

Topics include modules, graphics, timer control, file processing, run-time error handling, accessing databases with the database controls and user interface design concepts. (SP-EV/E)

^BIO04XX INTERNSHIP IN SUSTAINABILITY 3

Prerequisite: Senior standing

This is a capstone course that provides the student the opportunity to intern with another institution in the field of urban-ecology.

MATH0255 INTRODUCTORY STATISTICS LAB 1

Prerequisite: Concurrent enrollment in either MATH 0150 or MATH 0250

This course is a complementary course to introductory statistics courses and teaches students how to use common statistical software to conduct the statistical analyses required in MATH 0150 and MATH 0250.

(F/SP)

MATH0336 STATISTICAL COMPUTING 3

Prerequisite: Grade of C or better in MATH 0250 and MATH 0255 and MATH 0356

This course addresses the use of the computer as a tool for solving statistical problems of reasonable size. Students will be introduced to the varieties of statistical software packages that are currently available in the market.

MIS0207 OBJECT-ORIENTED PROGRAMMING This course covers topics in graphical user interface

and implementation of graphical user interfaces in information system applications. It also covers language syntax, including standard input/output, conditional, loop and functional cell statements and related topics. The course includes hands-on experience creating, writing program interface, editing, compiling, debugging and running programs on stand-alone

MIS0310 INTRODUCTION TO COMPUTER GRAPHICS

Prerequisite: MIS 0207

This course covers the concepts of computer graphics through hands-on experience with a variety of graphic software and the opportunity to develop simple graphic programs using a systems programming language and studies the principles and techniques of representing data in graphical

form and related topics. **(F)**

MIS0311 ADVANCED COMPUTER GRAPHICS

Prerequisite: MIS 0207

This course covers advanced concepts of computer graphics through hands-on experience with a variety of graphic software, the development of graphic programs using a systems programming language and advanced study of the principles and techniques of representing data in graphical form and related topics. **(SP)**

RM0302 RESEARCH DESIGN AND STATISTICS

Prerequisite: RM 301, MATH 150

The purpose of this course is the application of the elements of research methodology and statistical analysis as applied to social and behavioral sciences. The course will develop the student's understanding of the research and statistical techniques toward judging the legitimacy of a researcher's claims based upon the statistical analysis and research results reported. Focus will be given to the application of statistical tests and what these given techniques accomplish statistically, the conclusions that can be researched using such techniques and how these results are reported.

^ New Courses